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INVESTIGATION SUMMARY TECHNICAL MEMORANDUM UNDERGROUND STORAGE TANK SITE A-16, INLAND AREA SITE 24

**Naval Weapons Station
Seal Beach Detachment Concord
Concord, California**

April 21, 2006

Prepared for:

**Naval Facilities Engineering Command
San Diego, California**

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Investigation Summary Technical Memorandum
Underground Storage Tank Site A-16, Inland Area Site 24
Naval Weapons Station, Seal Beach Detachment Concord, Concord, California

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ACRONYMS AND ABBREVIATIONS

µg/L	Microgram per liter
AB	Angle boring
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CCCHSD	Contra Costa County Health Services Department
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	U.S. Environmental Protection Agency
ESL	Environmental Screening Level
IA	Inland Area
IPT	Integrated Project Team West
KTW	KT&W Associates
mg/kg	Milligram per kilogram
NWS	Naval Weapons Station
PRG	Region 9 U.S. EPA Preliminary Remediation Goal
RI	Remedial Investigation
SCAPS	Site Characterization and Analysis Penetrometer System
Sullivan	Sullivan Consulting Group
SulTech	A joint venture of Sullivan International Group and Tetra Tech EM Inc.
SVOC	Semivolatile organic compound
SWRCB	State Water Resource Control Board
Tetra Tech	Tetra Tech EM Inc.
TPH	Total petroleum hydrocarbons
TPH-d	Total petroleum hydrocarbons as diesel
TPH-e	Total petroleum hydrocarbons-extractable
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TPH-p	Total petroleum hydrocarbons-purgeable
UST	Underground storage tank
VOC	Volatile organic compound
Water Board	Regional Water Quality Control Board

1.0 INTRODUCTION

SulTech, a joint venture of Sullivan Consulting Group (SULLIVAN) and Tetra Tech EM Inc. (Tetra Tech), received Contract No. N68711-03-D-5104, Contract Task Order 0106, from the U.S. Department of the Navy, Integrated Product Team West (IPT), Naval Facilities Engineering Command. This contract task order was awarded under the SulTech Indefinite Quantity Contract for Architectural-Engineering Services to Provide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Resource Conservation and Recovery Act/Underground Storage Tank (UST) Studies. Under Contract Task Order 0106, SulTech provided support and oversight for investigations at UST Site A-16 and Inland Area (IA) Site 24 at Naval Weapons Station Seal Beach Detachment (Detachment Concord) in Concord, California.

Information on the purpose of the investigation, the site background, the site description, the physical setting, and a summary of previous investigations is presented in [Section 1.0](#). Information on the field activities and analytical results for UST Site A-16 and IA Site 24 are presented in [Section 2.0](#). The conclusions of the investigations and recommendations for additional site investigation or closure at each site are presented in [Section 3.0](#). References used in preparing this report are presented in [Section 4.0](#). Figures, tables and appendices are presented after the text.

1.1 PURPOSE OF THE INVESTIGATION

This investigation is in response to the California San Francisco Bay Regional Water Quality Control Board (Water Board) requirement that additional data for soil and groundwater were needed to support a low-risk closure for groundwater. Pursuant to the Water Board's requirement, SulTech installed three borings beneath Building A-16 and two monitoring wells, one upgradient near the UST and one downgradient (on the north side of Building A-16). Soil samples were collected at UST Sites A-16 to obtain additional data in support of a low-risk closure of the site. These data will supplement the information compiled in the "Final Investigation Summary Report for UST Sites A-16, E-108, and A-3A" ([Tetra Tech 2003](#)) and the recommendation presented in the "Final Investigation Summary Report for the Removal of Underground Storage Tanks, Sites A-16, E-108, and Port Chicago Main Street Auto Shop" ([SulTech 2005](#)).

Soil samples were collected at IA Site 24 to collect additional information regarding the extent of potential total petroleum hydrocarbon (TPH) contamination at IA Site 24.

1.1.1 Technical or Regulatory Standards

SulTech prepared a sampling and analysis plan, which consisted of a field sampling plan and a quality assurance project plan in an integrated format, to guide the field, laboratory, and data reporting efforts associated with the oversight and sampling phase of this project ([SulTech 2004](#)).

The Navy has complied with Assembly Bill 2886 and has uploaded post-September 2001 analytical data to the Water Board's GeoTracker database. Additionally, the analytical data associated with this investigation have been uploaded to the Water Board's GeoTracker database, and an electronic file supported by Microsoft Access was provided to the Water Board to assist in issuing this technical memorandum.

Analytical results were compared with Water Board Environmental Screening Levels (ESL) for both a commercial/industrial land use where the groundwater *is* and *is not* a current or potential source of drinking water. The ESLs are found in the Water Board "Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater" (Water Board 2005). The Water Board will also use the "Interim Guidance on Required Clean up at Low-Risk Fuel Sites" (Water Board 1996). In addition, the Water Board has identified the following additional policies that affect closure of low-risk sites: Resolution 89-39, State Water Resource Control Board (SWRCB) Resolution 68-16, SWRCB Resolution 88-63, SWRCB Resolution 92-49, and California Code of Regulations Title 23, Division 3, Chapter 16, UST Regulations. The ESLs for this project are presented in Table 1 and Table 2.

1.2 FACILITY BACKGROUND

Detachment Concord is located in the north-central portion of Contra Costa County, about 30 miles northeast of San Francisco, California (Figure 1). The facility operates a deep-water terminal to transfer ordnance between trucks or railcars and ships. The facility covers nearly 13,000 acres and is bounded on the north by Suisun Bay and on the south by the City of Concord.

The general layout of Detachment Concord and the location of the investigation site are presented in Figure 2. Currently, the facility contains three separate land holdings: the Tidal Area, where UST Site A-16 is located; the Inland Area, where IA -24 is located; and a Radiography Facility in Pittsburg, California. The Tidal Area encompasses about 6,800 acres and includes seven islands in Suisun Bay. The majority of the Tidal Area consists of wetlands bordering Suisun Bay. The Inland Area encompasses 6,200 acres. The Inland Area lies between Los Medanos Hills and the City of Concord. A Navy-owned road and rail line link the Inland Area to the Tidal Area.

1.3 SITE DESCRIPTION

UST Site A-16 is in the northern portion of Detachment Concord tidal area (Figure 2), as described in detail below.

This site includes Building A-16 and the surrounding area (Figure 3) and is 500 feet south of Suisun Bay. A portion of the area adjacent to the building is paved with concrete driveways; the remainder of the site is unpaved. The former 1,000-gallon UST was used to supply diesel fuel to a former boiler in Building A-16. Building A-16 currently is used to store a boat and floating

booms for use in the event of oil spills to surface water at the ship-loading piers. The current and future land use of the site is military industrial.

IA Site 24 is located in the Inland Area along the eastern side of Kinne Boulevard ([Figure 4](#)). The site includes Buildings IA-24, IA-24A, and IA-24-B, and the surrounding area. IA Site 24 was formerly used for forklift maintenance and battery service. Former UST IA-24A was located beneath a concrete driveway on the southwestern side of Building IA- 24 and contained diesel fuel used to heat Building IA-24A. Former UST IA-55 was located on the northwestern side of Building IA-55 and was used to store diesel fuel to heat Building IA-55. The current land use of the site is military industrial and future land use may be mixed residential/commercial or industrial.

1.4 PHYSICAL SETTING

UST Site A-16 is located in the Tidal Area near Suisun Bay. Bedrock units in the Tidal Area are overlain by young estuarine sediments deposited in an environment similar to the wetlands and mudflats near Suisun Bay. Fine-grained sediment, silt, and clay, with a relatively high organic content, characterize these deposits. Wetland sediments have been covered by fill material to an elevation of a few feet above sea level. Groundwater occurs in a shallow unconfined zone at about 2 to 4 feet below ground surface (bgs) and may be tidally influenced in areas near Suisun Bay ([Tetra Tech 1997a](#)).

Site soils at UST Site A-16 are typical embayment fine-grained sands, estuarial silts and clays, and occasional gravel layers or channels. IA Site 24 shows similar stratigraphy, with a deeper groundwater table.

Native soil at IA Site 24 includes silty clay, sand, and silt. Yellow-brown silty clay underlies the fill materials. Late Pleistocene alluvium is exposed at the groundwater surface in the area of IA Site 24. The alluvium consists of weakly consolidated, irregularly interbedded clay, silt, sand, and gravel deposits ([KT&W Associates \[KTW\] 1997a](#)). Groundwater beneath the Inland Area commonly resides in the coarser sand and gravel units of unconsolidated alluvial deposits. Typically, groundwater is first encountered at depths of approximately 25 to 50 bgs under semiconfined to confined conditions. Based on the available information, the upper 30 to 80 feet of sediments is believed to consist of discontinuous sand and gravel layers surrounded by a silt and clay matrix. Depth to groundwater in these units is variable, and locally perched conditions appear to exist ([Tetra Tech 2005](#)).

1.5 SUMMARY OF PREVIOUS INVESTIGATIONS

The following sections provide a summary of previous investigation of UST Site A-16 and Site IA-24. This information is discussed in more detail in the “Final Investigation Summary Report for UST Sites A-16, E-108, and A-3A, Naval Weapons Station (NWS) Seal Beach Detachment Concord” ([Tetra Tech 2003](#)), “Final Corrective Action Plan Underground Storage Tank Site A-16 and E-108, NWS Seal Beach Detachment Concord” ([Tetra Tech 2004](#)), the

“Final Investigation Summary Report for the Removal of USTs, Sites A-16, E-108, and Port Chicago Main Street Auto Shop” (SulTech 2005), and the “Draft Final Record of Decision Inland Area Site 24 (Tetra Tech 2005).

1.5.1 UST Site A-16

In November 1990, the Navy removed a 1,000-gallon diesel tank from UST Site A-16 (Figure 3). When it was removed, bottom holes and a split seam were found on this diesel tank (Minter & Fahy 1990). Two soil samples were collected from the bottom of the tank pit at 5 feet bgs and were analyzed for total petroleum hydrocarbons-extractable (TPH-e) and benzene, toluene, ethylbenzene, and xylenes (BTEX). Total petroleum hydrocarbons as diesel (TPH-d) at concentrations of 120 and 190 milligrams per kilogram (mg/kg) were detected in the sample collected below the tank, along with low concentrations of BTEX compounds. The UST pit was overexcavated, and a confirmation sample was collected at 8 feet bgs and analyzed for TPH-e. The result for the sample was nondetect at a detection limit of 10 mg/kg. Contra Costa County Health Services Department (CCCHSD) required additional investigations at UST Site A-16 because of the holes in the tanks and the hydrocarbons detected in the soil from below the tank at 5 feet bgs (CCCHSD 1994).

In October 1998, a 16-foot-deep boring (A016SB01) was installed at the former location of UST Site A-16. One soil sample was collected from unsaturated soil just below the depth of the pit bottom of the former tank (8 feet), and a grab groundwater sample was collected (16 feet). The soil sample contained TPH-e as diesel at 570 mg/kg and as motor oil (TPH-mo) at 170 mg/kg. The groundwater sample contained TPH-e as diesel at 9,000 micrograms per liter (µg/L) and benzene at 2.0 µg/L, ethylbenzene at 0.8 µg/L, and o-xylene at 0.3 µg/L.

Based on analytical results from the first boring, a second phase of investigation was conducted in November 1998. Five additional 15-foot-deep “step-out” borings (A016SB02 through A016SB06) were installed surrounding the former location of the UST. Samples from only one of these borings (A016SB04 at 8 to 9 feet bgs) contained detectable concentrations of hydrocarbons, and the extent of detectable hydrocarbon concentrations is bounded by the other four borings. Grab groundwater samples were collected from three of the five step-out borings; two borings (A016SB02 and A016SB03) did not produce sufficient water to collect samples, however. Each of the three samples contained detectable concentrations of hydrocarbons.

A third phase of investigation was conducted in February 1999 because the extent of hydrocarbon contamination in groundwater was not completely characterized. Three monitoring wells were installed (A016MW01, A016MW02, and A016MW03) in this phase. None of the three wells contained detectable concentrations of hydrocarbons during the 1999 sampling event. No free-phase product was observed during the investigations of UST Site A-16. Soils typically encountered during drilling at UST Site A-16 were composed of silty or clayey fine to medium sands from the surface to about 8 feet bgs. This sandy unit probably represents imported fill material and forms the water-bearing zone beneath UST Site A-16.

Groundwater elevations were measured in the three monitoring wells on March 11, 1999. The inferred direction of groundwater flow is to the southwest, away from Suisun Bay, which is about 300 feet north of UST Site A-16. The direction of groundwater flow (away from Suisun Bay) and the relatively steep hydraulic gradient (0.054 feet per foot) are unexpected in a bay margin environment such as UST Site A-16. The unusual groundwater gradient may be attributable to the heterogeneous nature of the fill material at the site, which results in a lack of laterally contiguous, permeable soils. This heterogeneous nature was illustrated by the two 15-foot-deep borings previously mentioned, which yielded no groundwater over a 3-day period before they were grouted.

The Water Board requested an additional monitoring well be installed and sampled at UST Site A-16 based on its review of the "Draft Investigation Summary Report for UST Sites A-16 and E-108" (Tetra Tech 1999).

On May 8, 2002, Tetra Tech and Uribe and Associates personnel installed monitoring well A016MW04 to a depth of 15 feet bgs (Tetra Tech 2003). Groundwater was encountered during drilling at 5 feet bgs in a silty clay interval that became clayey at 6 feet bgs. Slight hydrocarbon staining was noted from 5 to 7.5 feet bgs, which may represent a smear zone. A 2-inch-diameter polyvinyl chloride monitoring well casing was installed and screened across an interval from 4 to 14 feet bgs. Subsequently, this well was developed and sampled on May 19, 2002, when the water level was noted to be at 11 feet bgs.

The groundwater gradient was replotted, and the results confirm the southeasterly gradient away from the site and Suisun Bay (Tetra Tech 2003). The steepness of the gradient varies considerably, depending on the static water level that is used. It is the Navy's opinion that the gradient is considerably less steep than was previously reported and depends on which three wells are used to plot the gradient. Varying water levels found in each of the four wells at UST Site A-16 are not surprising when the heterogeneous nature of the silty intervals found in each of the monitoring wells installed at UST Site A-16 is considered.

Groundwater samples were collected from all four wells in May 2002. The groundwater samples from all four wells at UST Site A-16 were analyzed for TPH and BTEX; groundwater sampled from wells A016MW03 and A016MW04 also was analyzed for semivolatile organic compounds (SVOC) and methyl tertiary butyl ether. TPH-d was encountered at levels high enough (548,000 µg/L) to suggest the presence of free-phase product in groundwater at this location. The field crew noted up to 2 inches of free-phase product during well development. However, it was easily drawn off and the well would quickly run "dry," necessitating that the sampling crew wait a few days to return and resample the well.

Low levels of TPH-d and TPH-mo were detected in the samples from at well A016MW02, upgradient from the former UST Site A-16. These detections may be attributable to the reportedly elevated levels of natural organic material in soils. A review of field crew notes and the approved sampling plan does not indicate that turbid groundwater samples were to be filtered before they were submitted to the analytical laboratory for processing. It is also not indicated whether the analytical laboratory used silica gel cleanup technology to avoid false positives

caused by naturally occurring organic matter. It is possible that low TPH “hits” in the samples from Well A016MW02 are from matrix interference caused by naturally occurring organic materials in suspended sediments in the water samples.

In 2003, the Navy Public Works Center San Diego Environmental Department performed a site characterization investigation of UST Site A-16. This investigation used the Site Characterization and Analysis Penetrometer System (SCAPS) and occurred between June 23 and August 4, 2003. A total of 11 laser-induced fluorescence pushes were advanced at the site, and five soil samples and seven groundwater samples were collected for laboratory analysis of various TPH compounds. Results of the SCAPS investigation indicate the presence of TPH contamination at five of the 11 laser-induced fluorescence locations. TPH contamination was found in four of the five laboratory soil samples, with the highest concentration — TPH-d at 2,600 mg/kg — occurring at push location A16-02. Detectable levels of TPH were found in four of the seven groundwater samples, with the highest concentration — TPH- d at 15,000 µg/L — occurring at push location A16-MW-04.

In June 2004, remaining TPH-contaminated soil was excavated to a depth of 14 feet bgs from UST Site A-16. Additionally, monitoring well A016MW04 was excavated and decommissioned. Confirmation soil samples were collected from the four sidewalls and the base of the excavation after the initial target volume of about 560 cubic yards of soil had been removed. The sample collected from the north sidewall contained TPH-d (7,700 mg/kg) and TPH as gasoline (TPH-g) (770 mg/kg) at concentrations above the Water Board ESL of 500 mg/kg for TPH-d and 400 mg/kg for TPH-g. TPH-d was detected at a concentration above the ESL in the sample collected from the west sidewall at a concentration of 850 mg/kg ([SulTech 2005](#)).

In July 2004, an additional 100 cubic yards of soil was overexcavated from the north and west sidewalls of the excavation based on the results of the confirmation sampling. A second set of confirmation samples was then collected from the north and west sidewalls. TPH-d was detected at a concentration above the ESL in both the west sidewall sample (1,100 mg/kg) and the north sidewall sample (13,000 mg/kg). TPH-g was detected at a concentration of 550 mg/kg, which exceeds the ESL, in the north sidewall sample ([SulTech 2005](#)). An additional 130 cubic yards of soil was overexcavated from the northwestern corner and west sidewall of the excavation based on the results from the second round of confirmation sampling. Final confirmation samples were collected from the west sidewall and northwestern corner; TPH-d and TPH-g were not detected at concentrations above ESLs ([SulTech 2005](#)).

A total of 790 cubic yards was excavated and removed from UST Site A-16. Analytical results for the confirmation samples indicate that TPH-contaminated soil was excavated and removed from the east, south, and west sidewalls and the base of the excavation to concentrations below Water Board ESLs. However, TPH-contaminated soil at concentrations above ESLs remains in the north sidewall of the excavation, near Building A-16. Additional soil removal and excavation could not be continued without compromising the integrity of the building foundation.

Water samples were collected from the water that accumulated in the bottom of the excavation; TPH-d was detected above the ESL at concentrations of 2,000 µg/L and 3,000 µg/L (duplicate sample).

1.5.2 Inland Area Site 24

IA Site 24 is located along the eastern side of Kinne Boulevard, about 3 miles from the front gate. IA Site 24 and the surrounding areas were formerly used for forklift maintenance and battery recharging. An asphalt parking lot for forklift storage was located along the southeastern wall of Building IA-24. Forklifts and batteries were steam-cleaned to remove oil and grease. The steam-cleaning area, last used in 1988, discharged condensate, oil, and grease through a pipeline from the southwestern side of Building IA-24 into Seal Creek.

The unpaved area between Buildings IA-24 and IA-55 was used for parking trucks. A 550-gallon diesel UST was located near the western corner of Building IA-55, and a 2,000-gallon diesel UST was located on the southern corner of Building IA-24 ([Figure 4](#)). Both USTs were removed and overexcavated in early February 1997 and replaced with aboveground tanks. A complete discussion of the UST excavation can be found in “Removal of Underground Storage Tank Site IA24A ([KTW 1997a](#)) and “Closure of Underground Storage Tank Site IA55” ([KTW 1997b](#)).

A site investigation was conducted at IA Site 24 in 1992. Soil and groundwater were sampled to evaluate environmental conditions and evaluate whether further action, immediate action or removal, or no further action was appropriate. Site 24 was deemed appropriate for further investigation to evaluate the steam discharge line and the presence of metals in groundwater.

A remedial investigation (RI) was conducted at IA Site 24 in 1995. Soil, sediment, and groundwater were sampled during RI field activities from April 1995 to June 1995, and groundwater was sampled again in September 1995, to evaluate environmental conditions and to assess the need for cleanup actions at the site. The RI report compared the analytical results against the 1995 U.S. Environmental Protection Agency (EPA) Region 9 Preliminary Remediation Goals (PRG) current at that time ([EPA 1995](#)) during evaluation of the environmental conditions at the Inland Area sites. These comparisons were used to assist in delineating site-related contamination and to focus the discussion of chemical characterization in the report. Soil, sediment, and groundwater were sampled at Site IA-24 to evaluate the nature and extent of chemicals present as a result of past site activities, including forklift maintenance and USTs. Sampling focused on the areas of a suspected sump for disposal of battery acid, a steam-cleaning pad with an outfall to Seal Creek, a fuel UST at Building IA-55, and the site drainage channels. A suspected sump for disposal of battery acid was alleged to have been present at the site, but observations during field sampling and the subsequent analytical laboratory results did not provide any evidence to confirm it.

Site soils were analyzed for total metals, hexavalent chromium, SVOCs, volatile organic compounds (VOC), TPH-e, and TPH-purgeable (TPH-p). Data for soil at the site were

compared with EPA residential PRGs (Tetra Tech 1997b). Except for benzo(a)pyrene, VOCs and SVOCs were detected in soil samples at concentrations below residential PRGs. Benzo(a)pyrene was detected (at concentrations ranging from 0.033 to 0.110 mg/kg) in three of 38 samples analyzed. Concentrations of benzo(a)pyrene exceeded the residential PRG (0.062 mg/kg) in two surface soil samples collected from a drainage ditch; these concentrations are comparable to levels commonly reported for urban and rural soils (Tetra Tech 1997b). Results for all other samples were not detected above the residential PRG, although detection limits (ranging from 0.340 to 0.440 mg/kg) were elevated compared with the PRG of 0.062 mg/kg (Tetra Tech 1997b).

Four metals were detected in soil samples collected in the 0- to 10-foot depth interval at concentrations that exceeded the 2002 PRGs. Arsenic was detected in almost all soil samples at concentrations that exceeded its residential PRG; however, concentrations in all samples were equal to or less than the established ambient limit of 7.3 mg/kg, so the presence of arsenic is not attributed to site activities. Lead was detected in samples collected at two locations at concentrations that exceed the Cal-modified residential PRG of 150 mg/kg but below the EPA 2002 PRG of 400 mg/kg; the maximum detected concentration was 225 mg/kg. Manganese and thallium were detected at concentrations above the residential PRG, but only at samples collected at depths greater than 10 feet bgs. No petroleum hydrocarbons were detected in samples collected near the former USTs. The maximum concentration of TPH-mo (1,300 mg/kg) in soil was detected in a sample collected from a drainage ditch, and the maximum concentration detected in sediment (4,100 mg/kg) was found in a sample collected at Seal Creek. Inorganic chemicals were not identified above ambient levels in soil samples collected near the drainage ditches (Tetra Tech 1997b).

Site sediments were also sampled as part of the RI field activities. No VOCs or SVOCs were detected in sediments. Metals were not detected at concentrations that exceed the PRGs in sediment, except for arsenic. Arsenic was detected in sediment at a maximum concentration of 5.7 mg/kg, which is below the ambient value for soils. The RI report includes a comprehensive discussion of the soil investigation and the nature and extent of the chemicals detected in soil and sediment (Tetra Tech 1997b).

Five monitoring wells were installed at the site during the RI. Two rounds of unfiltered groundwater samples were collected during the RI (in May and September 1995) and were analyzed for VOCs, SVOCs, metals, nitrate/nitrite, and TPH-e. Two additional rounds of unfiltered groundwater samples were collected and analyzed for SVOCs after the RI (in January and April 1998). All groundwater samples were collected using low-flow purge methods. It is not clear whether silica gel cleanup technology was used to avoid false positives caused by naturally occurring organic matter.

Metals were not detected at concentrations that exceed tap water PRGs in groundwater samples collected from IA Site 24. VOCs, SVOCs, and petroleum hydrocarbons have not been detected consistently in groundwater samples collected at the site. However, bis (2-ethylhexyl) phthalate,

a common laboratory contaminant, was detected in samples from two wells at concentrations of 55 and 60 µg/L during the first RI groundwater sampling in May 1995. Bis (2-ethylhexyl) phthalate was not detected during the second RI groundwater sampling event. Two additional groundwater monitoring events were conducted to evaluate whether the results for the samples collected during the RI were representative of actual groundwater conditions. Bis (2-ethylhexyl) phthalate was not detected in samples collected during either groundwater monitoring event after the RI. Based on these findings, the Navy concluded that bis (2-ethylhexyl) phthalate is not present in groundwater at IA Site 24 ([Tetra Tech 1997b](#)).

2.0 INVESTIGATION RESULTS

The following sections describe the results for samples collected at UST A-16 and IA Site 24 on October 31 and November 1, 2005. Complete analytical results are presented in Appendix A, soil boring logs appear in Appendix B, and well completion forms are in Appendix C.

2.1 UST SITE A-16

Three angled borings (60 degrees to the horizon) were advanced beneath Building A-16 to a maximum linear depth of 30 feet, achieving a vertical depth of 26 feet beneath the building. Soil samples were collected by using a continuous core direct-push rig. Soil samples were collected at three intervals. Samples were collected in clear sampling sleeves, capped with Teflon tape, and sent to Curtis and Tompkins Laboratories for analysis of TPH-e. Ten soil samples were collected as per the approved work plan ([SulTech 2005](#)); and one additional sample (099A16002-11.5) was judgmentally collected because photoionization detector readings were elevated.

Analytical results ranged from an estimated concentration of 0.86 mg/kg to 2,400 mg/kg. Soil samples were collected at three intervals beneath building A-16 at 6, 12 and 18 feet. TPH-d and TPH-mo were detected in all three depths of angle boring (AB)-01, but particularly at 12 feet bgs (2,400 and 140 mg/kg). AB-02 had negligible detections of TPH-d and TPH-mo (less than 11 mg/kg) at all depths. Likewise, the results for AB-03 were similar to AB-02, with negligible detections of TPH-d and TPH-mo (less than 12 mg/kg) except for TPH-d at 18 feet, which was 35 mg/kg. Figure 3 presents a graphical presentation of soil sampling analytical results and locations, and Table 1 presents a summary of the analytical results for UST site A-16.

2.2 INLAND AREA SITE 24

Twelve hand auger samples were collected at IA Site 24 to a maximum depth of 3.5 feet. Samples were collected into 8-ounce amber glass jars and sent to Curtis & Tompkins Laboratory for analysis of TPH-e. Analytical results ranged from non-detect to 230 mg/kg. Figure 4 presents a graphical presentation of soil sampling analytical results, and Table 2 presents a summary of the analytical results for Site IA-24.

2.3 GLOBAL POSITIONING SYSTEM SATELLITE SURVEY

The location of the three angled borings and the two monitoring wells at UST Site A-16 were surveyed using global positioning system satellite instrumentation. Horizontal accuracy is 1.6 feet and vertical accuracy is 3.2 feet. At a later date, the Navy will perform a survey by a licensed land surveyor for the two monitoring wells installed at Site A-16.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The following subsections present the conclusions of the investigations and the recommendations for additional investigation or closure of each UST site.

3.1 UST SITE A-16

Analytical results for samples from AB-02, AB-03 and MW-06 do not exceed ESLs for soil. Analytical results confirm that soil contaminated by TPH-d at concentrations above ESLs remains in the area near AB-01 along the northwestern sidewall of the former UST excavation. Analytical results from the confirmation samples collected during the 2004 soil removal indicate that TPH-contaminated soil was excavated and removed from the east, south, and west sidewalls and the base of the excavation to concentrations below Water Board ESLs ([SulTech 2005](#)). It is recognized that the concentration in the northwestern sidewall of the former excavation exceeds ESLs; however, the 2004 soil removal could not be continued without compromising the integrity of the building foundation. Given that the current and future land use is military/industrial; there are currently no completed exposure pathways for soils at the site, and sensitive receptors are unlikely to be exposed to soil contamination. Therefore, the site poses no significant risk to human health or the environment.

SulTech recommends that groundwater be monitored quarterly for 1 year to evaluate the trends in concentration and possible degradation in groundwater beneath the site. SulTech recommends groundwater sampling for the following: TPH-e, total dissolved solids, total organic carbon, alkalinity, iron II, nitrate, sulfate, methane, and Mn^{2+} . SulTech further recommends the site be evaluated using the Water Board's Interim Guidance on Required Cleanup at Low Risk Fuel Contaminated Sites ([Water Board 1996](#)).

3.2 INLAND AREA SITE 24

Soil samples were collected at IA Site 24 to collect additional information regarding the extent of potential TPH contamination at IA Site 24. Analytical results from soil samples collected at IA-24 report no concentrations above ESLs. Therefore, SulTech recommends no further action at this site.

4.0 REFERENCES

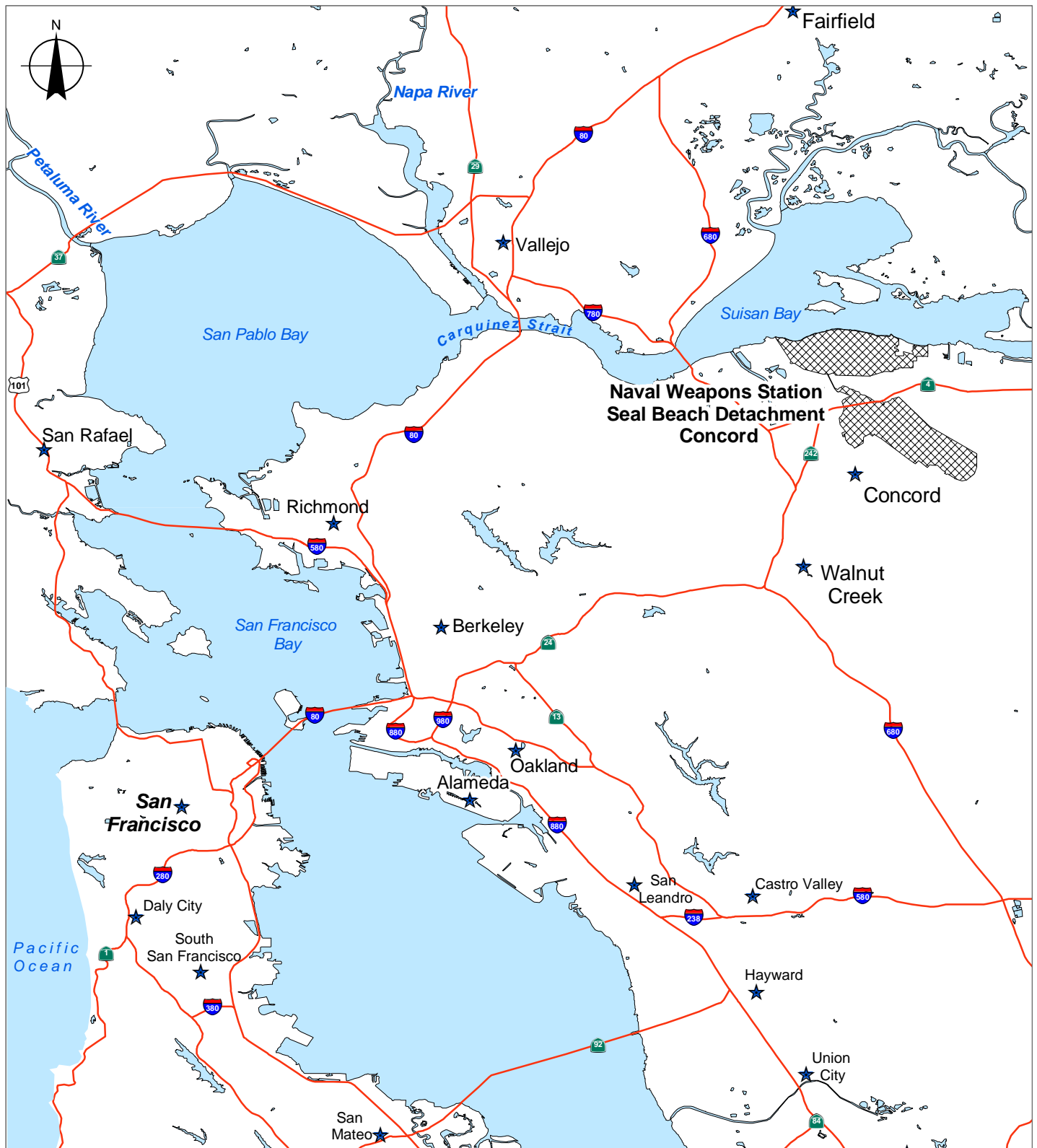
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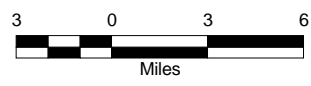
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FIGURES



NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD

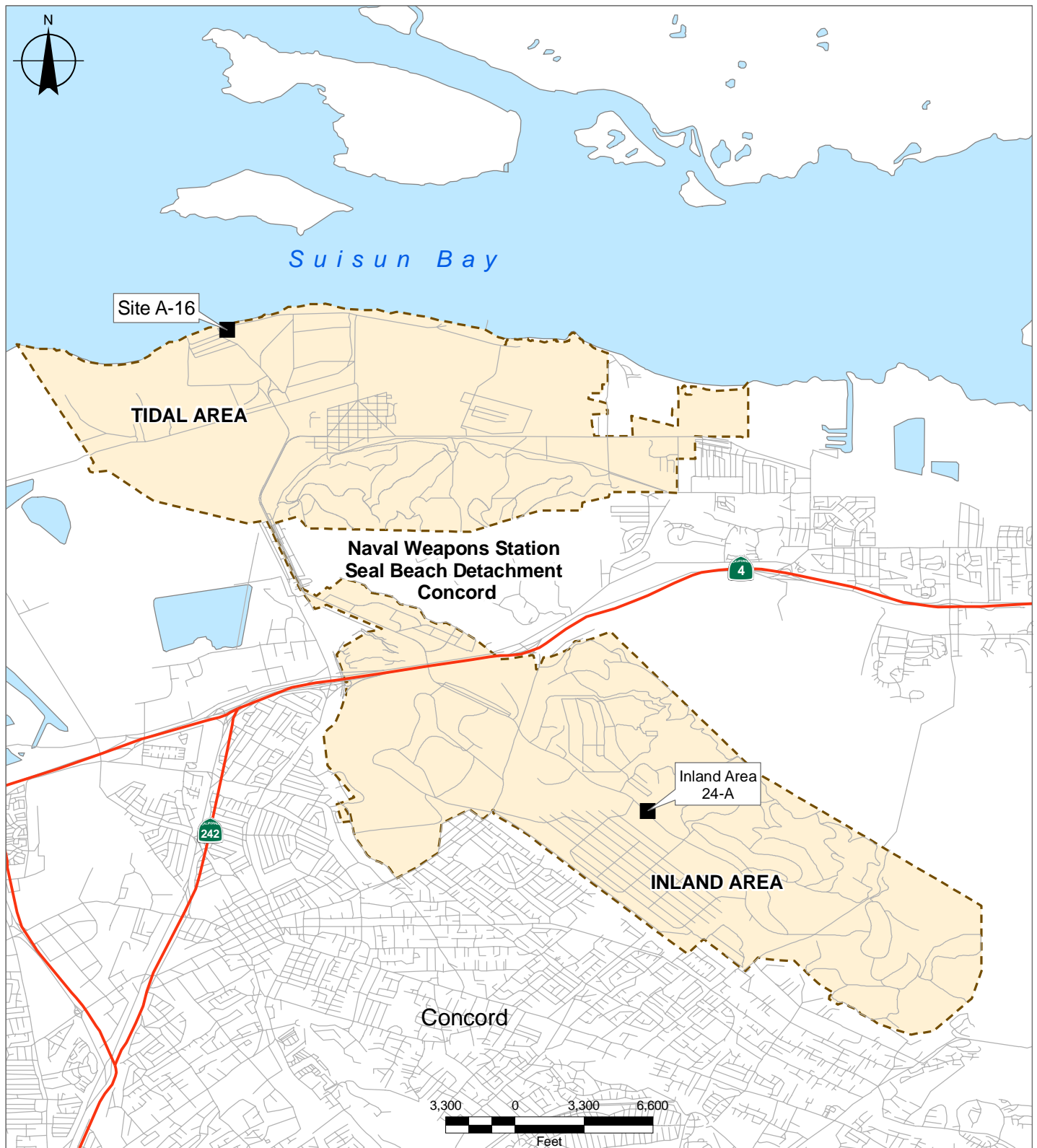


Naval Weapons Station Seal Beach
Detachment Concord

FIGURE 1

FACILITY VICINITY MAP

Investigation Summary
Technical Memorandum Underground Storage
Tank Site A-16 and Inland Area Site 24



- UST SITE
- ROAD
- HIGHWAY
- NAVAL WEAPONS STATION, SEAL BEACH DETACHMENT CONCORD
- WATER

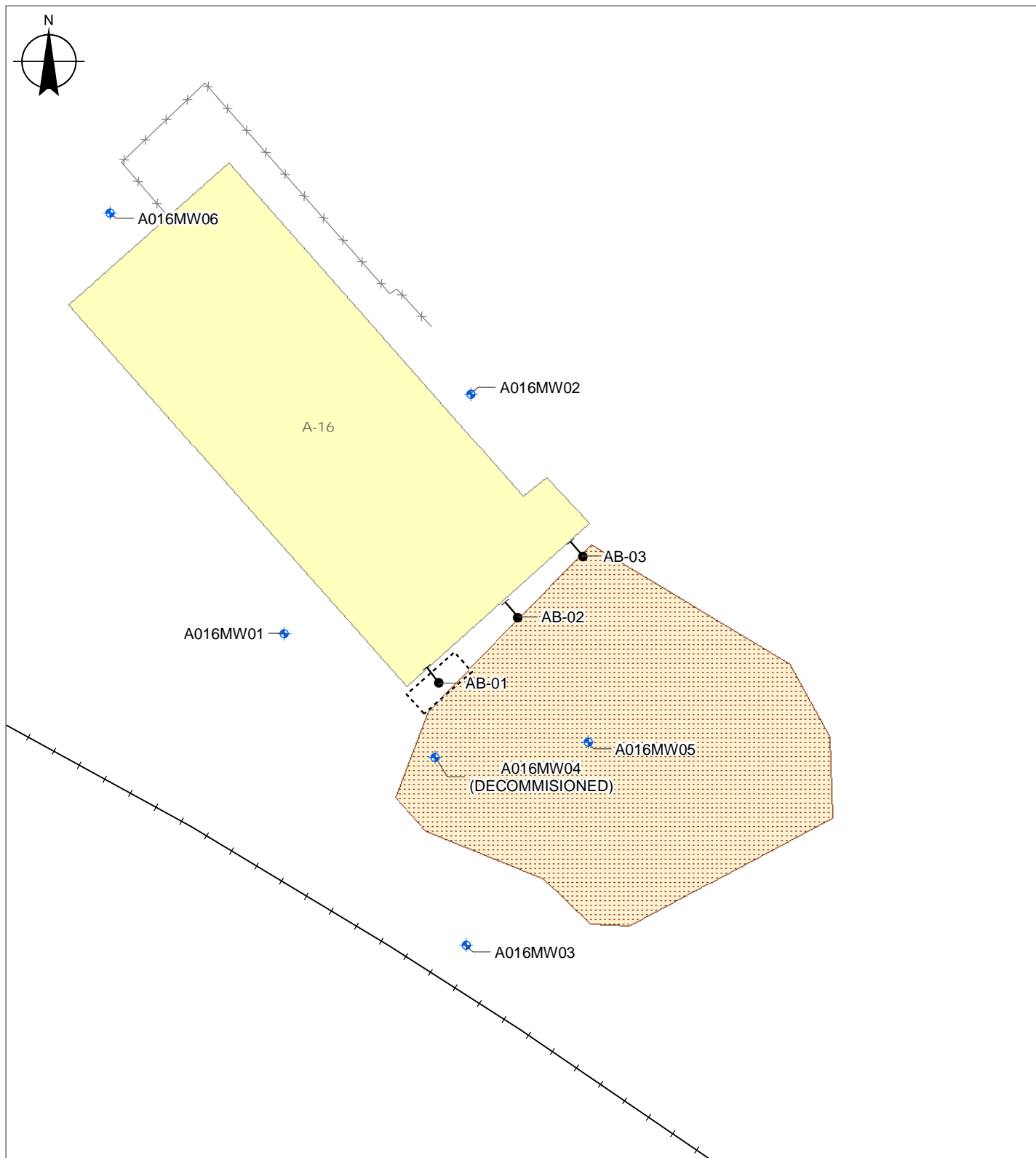


Naval Weapons Station Seal Beach
Detachment Concord

FIGURE 2

SITE LOCATION MAP

Investigation Summary
Technical Memorandum Underground Storage
Tank Site A-16 and Inland Area Site 24



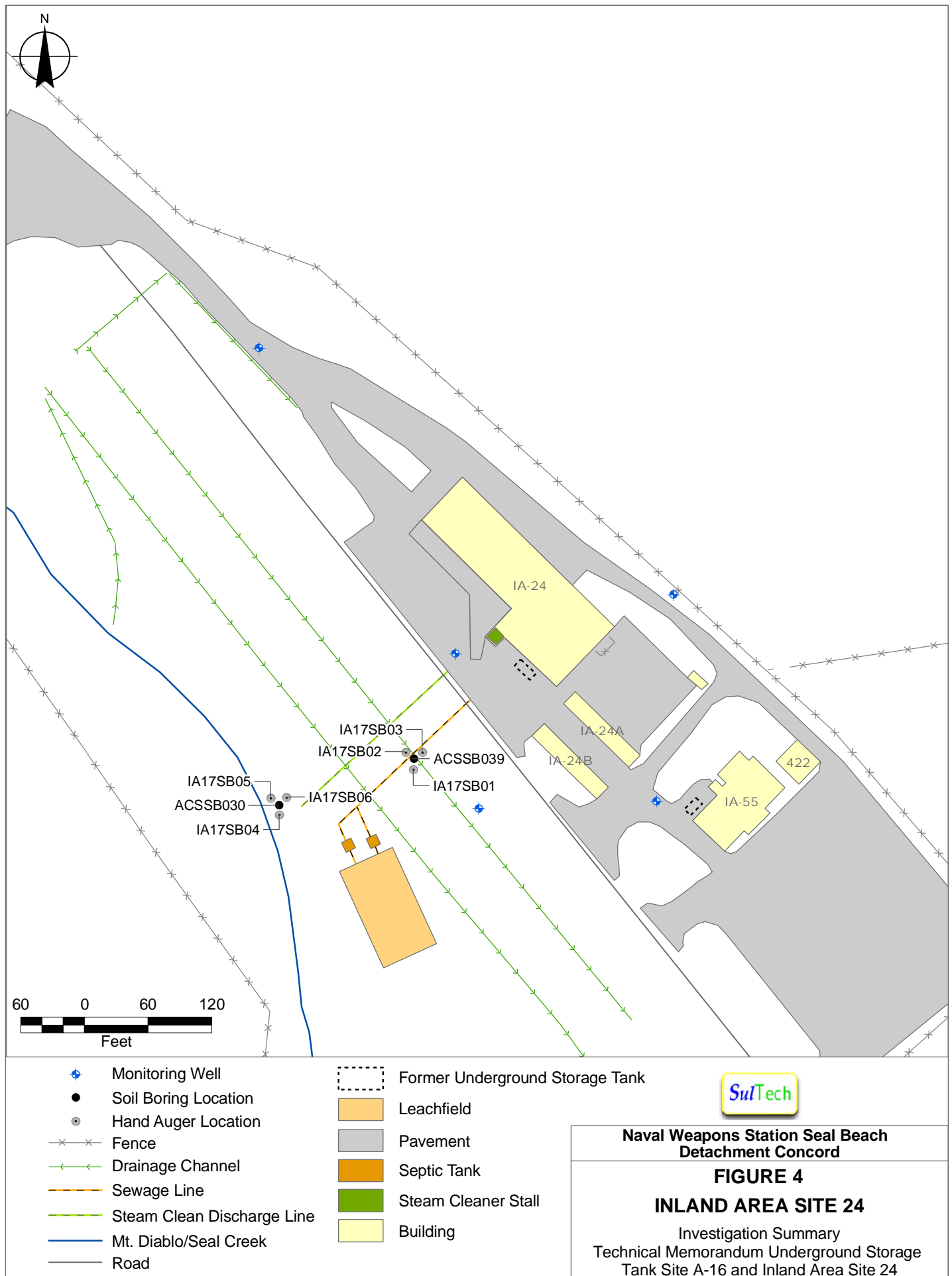
- Monitoring Well
- Angle Boring
- Fence
- Railroad
- Underground Storage Tank Footprint
- Excavation Area
- Building



Naval Weapons Station Seal Beach
Detachment Concord

FIGURE 3
UNDERGROUND STORAGE
TANK SITE A-16

Investigation Summary
Technical Memorandum Underground Storage
Tank Site A-16 and Inland Area Site 24



TABLES

TABLE 1: SUMMARY OF ANALYTICAL RESULTS OF SOIL SAMPLING, SITE A-16

Investigation Summary, Technical Memorandum, UST Site A-16, Inland Area Site 24, NWS SBD
Concord, Concord, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Analyte	
				TPH-d	TPH-mo
				ESL ¹	ESL ²
				500	1,000
				100	500
Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	mg/kg	mg/kg
A016MW06	099A16SB007	10.31.05	6.0-6.5	1.8	11
A016MW06	099A16SB008	10.31.05	12.0-12.5	7.3	15
A016MW06	099A16SB009	10.31.05	18.0-18.5	22	120
A16AB-01	099A16AB001	10.31.05	6.0-6.5	5.5	13
A16AB-01	099A16AB002-11.5	10.31.05	11.5-12.0	2,400	140
A16AB-01	099A16AB002	10.31.05	12.0-12.5	1,000	78
A16AB-01	099A16AB003	10.31.05	18.0-18.5	520	42
A16AB-02	099A16AB004	10.31.05	6.0-6.5	1.6	6.9
A16AB-02	099A16AB005	10.31.05	12.0-12.5	1.5	3.5
A16AB-02	099A16AB006	10.31.05	18.0-18.5	1.2	10
A16AB-03	099A16AB007	10.31.05	6.0-6.5	11	7.8
A16AB-03	099A16AB008	10.31.05	12.0-12.5	0.86	2.5
A16AB-03	099A16AB009	10.31.05	18.0-18.5	35	15

Notes:

Values above Environmental Screening Levels are shown in **bold**.

- 1 California Regional Water Quality Control Board. 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. February. (Deep soil screening level [<3m bgs], Commercial/Industrial land use, groundwater is NOT a current or potential drinking water resource.)
- 2 California Regional Water Quality Control Board. 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. February. (Deep soil screening level [<3m bgs], Commercial/Industrial land use, groundwater IS a current or potential drinking water resource.)

ESL Environmental Screening Level
ft bgs Feet below ground surface
ID Identification
m Meter
mg/kg Milligrams per kilogram
TPH-d Total petroleum hydrocarbons as diesel
TPH-mo Total petroleum hydrocarbons as motor oil

TABLE 2: SUMMARY OF ANALYTICAL RESULTS OF SOIL SAMPLING, SITE IA-24

Investigation Summary, Technical Memorandum, UST Site A-16, Inland Area Site 24, NWS SBD
Concord, Concord, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Analyte	
				TPH-d	TPH-mo
				ESL ¹	ESL ²
				500	1,000
				100	500
Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	mg/kg	mg/kg
IA24SB01	099IA24SB001	10.31.05	0.0-0.5	32	230
IA24SB01	099IA24SB002	10.31.05	3.0-3.5	20	120
IA24SB02	099IA24SB003	10.31.05	0.0-0.5	20	120
IA24SB02	099IA24SB004	10.31.05	3.0-3.5	0.67	6.6
IA24SB03	099IA24SB005	10.31.05	0.0-0.5	28	160
IA24SB03	099IA24SB006	10.31.05	3.0-3.5	1.1	5.5
IA24SB04	099IA24SB007	11.01.05	0.0-0.5	1	19
IA24SB04	099IA24SB008	11.01.05	3.5-4.0	1.1	1.8
IA24SB05	099IA24SB009	11.01.05	0.0-0.5	0.7	12
IA24SB05	099IA24SB010	11.01.05	3.5-4.0	1	2.2
IA24SB06	099IA24SB011	11.01.05	0.0-0.5	0.68	17
IA24SB06	099IA24SB012	11.01.05	3.2-3.7	0.66	2.5

Notes:

Values above Environmental Screening Levels are shown in **bold**.

- 1 California Regional Water Quality Control Board. 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. February. (Deep soil screening level [<3m bgs], Commercial/Industrial land use, groundwater is NOT a current or potential drinking water resource.)
- 2 California Regional Water Quality Control Board. 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. February. (Deep soil screening level [<3m bgs], Commercial/Industrial land use, groundwater IS a current or potential drinking water resource.)

ESL Environmental Screening Level
ft bgs Feet below ground surface
ID Identification
m Meter
mg/kg Milligrams per kilogram
TPH-d Total petroleum hydrocarbons as diesel
TPH-mo Total petroleum hydrocarbons as motor oil

APPENDIX A
ANALYTICAL LABORATORY RESULTS

TABLE A-1: SUMMARY OF THE ANALYTICAL RESULTS OF SOIL SAMPLES SITE A-16

Investigation Summary, Technical Memorandum, UST Site A-16, Inland Area Site 24, NWS SBD Concord, Concord, California

Point ID	A016MW06	A016MW06	A016MW06	A16AB-01	A16AB-01	A16AB-01	A16AB-01
Sample ID	099A16SB007	099A16SB008	099A16SB009	099A16AB001	099A16AB002-11.5	099A16AB002	099A16AB003
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	10/31/2005	10/31/2005	10/31/2005	10/31/2005	10/31/2005	10/31/2005	10/31/2005
Sample Depth (in feet bgs)	6.0 - 6.5	12.0 - 12.5	18.0 - 18.5	6.0 - 6.5	11.5 - 12.0	12.0 - 12.5	18.0 - 18.5
Petroleum Indicators (in mg/kg)							
DIESEL RANGE ORGANICS	1.8 HY	7.3 HY	22 HJY	5.5 HY	2,400	1,000	520
MOTOR OIL RANGE ORGANICS	11	15	120 J	13	140 LY	78 LY	42 LY
Percent Moisture (percent)							
PERCENT MOISTURE	21	19	18	21	18	20	19

TABLE A-1: SUMMARY OF THE ANALYTICAL RESULTS OF SOIL SAMPLES SITE A-16 (Continued)

Investigation Summary, Technical Memorandum, UST Site A-16, Inland Area Site 24, NWS SBD Concord, Concord, California

Point ID	A16AB-02	A16AB-02	A16AB-02	A16AB-03	A16AB-03	A16AB-03
Sample ID	099A16AB004	099A16AB005	099A16AB006	099A16AB007	099A16AB008	099A16AB009
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	10/31/2005	10/31/2005	10/31/2005	10/31/2005	10/31/2005	10/31/2005
Sample Depth (in feet bgs)	6.0 - 6.5	12.0 - 12.5	18.0 - 18.5	6.0 - 6.5	12.0 - 12.5	18.0 - 18.5
Petroleum Indicators (in mg/kg)						
DIESEL RANGE ORGANICS	1.6 HY	1.5 HY	1.2 HJY	11 HY	.86 JY	35 H
MOTOR OIL RANGE ORGANICS	6.9	3.5 J	10	7.8	2.5 J	15 L
Percent Moisture (percent)						
PERCENT MOISTURE	19	18	23	20	18	19

Notes:

H	Pattern is in the heavier hydrocarbon end of the analyte's range in the standard
ID	Identification
J	Estimated value
L	Pattern is in the lighter hydrocarbon end of the analyte's range in the standard
Y	Chromatogram represents a fuel pattern but does not match the standard.
bgs	Below ground surface
mg/kg	Milligrams per kilogram
µg/kg	Micrograms per kilogram

TABLE A-2: SUMMARY OF THE ANALYTICAL RESULTS OF SOIL SAMPLES INLAND AREA SITE 24

Investigation Summary, Technical Memorandum, UST Site A-16, Inland Area Site 24, NWS SBD Concord, Concord, California

Point ID	IA24SB01	IA24SB01	IA24SB02	IA24SB02	IA24SB03	IA24SB03	IA24SB04
Sample ID	099IA24SB001	099IA24SB002	099IA24SB003	099IA24SB004	099IA24SB005	099IA24SB006	099IA24SB007
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	10/31/2005	10/31/2005	10/31/2005	10/31/2005	10/31/2005	10/31/2005	11/01/2005
Sample Depth (in feet bgs)	0.0 - 0.5	3.0 - 3.5	0.0 - 0.5	3.0 - 3.5	0.0 - 0.5	3.0 - 3.5	0.0 - 0.5
Petroleum Indicators (in mg/kg)							
DIESEL RANGE ORGANICS	32 HY	20 HY	20 HY	.67 HJY	28 HY	1.1 U	1 HJY
MOTOR OIL RANGE ORGANICS	230	120	120	6.6	160	5.5 U	19
Percent Moisture (percent)							
PERCENT MOISTURE	4	9	2	10	3	9	5

TABLE A-2: SUMMARY OF THE ANALYTICAL RESULTS OF SOIL SAMPLES INLAND AREA SITE 24 (Continued)

Investigation Summary, Technical Memorandum, UST Site A-16, Inland Area Site 24, NWS SBD Concord, Concord, California

Point ID	IA24SB04	IA24SB05	IA24SB05	IA24SB06	IA24SB06
Sample ID	099IA24SB008	099IA24SB009	099IA24SB010	099IA24SB011	099IA24SB012
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	11/01/2005	11/01/2005	11/01/2005	11/01/2005	11/01/2005
Sample Depth (in feet bgs)	3.5 - 4.0	0.0 - 0.5	3.5 - 4.0	0.0 - 0.5	3.2 - 3.7
Petroleum Indicators (in mg/kg)					
DIESEL RANGE ORGANICS	1.1 U	.7 HJY	1 U	.68 HJY	.66 JY
MOTOR OIL RANGE ORGANICS	1.8 J	12	2.2 HJ	17	2.5 J
Percent Moisture (percent)					
PERCENT MOISTURE	9	4	3	4	10

Notes:

bgs	Below ground surface
H	Pattern is in the heavier hydrocarbon end of the analyte's range in the standard
ID	Identification
J	Estimated value
mg/kg	Milligrams per kilogram
U	Not detected with detection limit indicated
Y	Chromatogram represents a fuel pattern but does not match the standard.
µg/kg	Micrograms per kilogram

APPENDIX B
SOIL BORING LOGS



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BORING NUMBER A016MW05

PAGE 1 OF 1

CLIENT	United States Department of the Navy	PROJECT NAME	UST A16
PROJECT NUMBER	B155-002	PROJECT LOCATION	Concord Naval Weapons Station
DATE STARTED	10/31/05	COMPLETED	11/1/05
DRILLING CONTRACTOR	Precision Drilling	GROUND ELEVATION	
DRILLING METHOD	Hollow Stem Auger	HOLE SIZE	8 Inches
LOGGED BY	J. Hamm	GROUND WATER LEVELS:	
CHECKED BY	D. Grant	AT TIME OF DRILLING	~16 Feet BGS
NOTES		AT END OF DRILLING	---
		AFTER DRILLING	---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
					CLAYEY GRAVEL WITH SAND (GC): 60/20/20, fine to coarse gravel, mostly coarse sand, clay, moist, dense, <u>FILL</u>	
4.0						
5					FAT CLAY (CH): 100% fines (clay), high plasticity, high dry strength, no dilatency, high toughness, grayish-brown (10 YR 5/2), strong petroleum odor, moist, stiff	
10	1		87		no petroleum odor	
15			65		grades to dark brown (10 YR 3/3), soft	
20			55		grades to dark gray (10 YR 4/1)	

Bottom of hole at 20.0 feet.

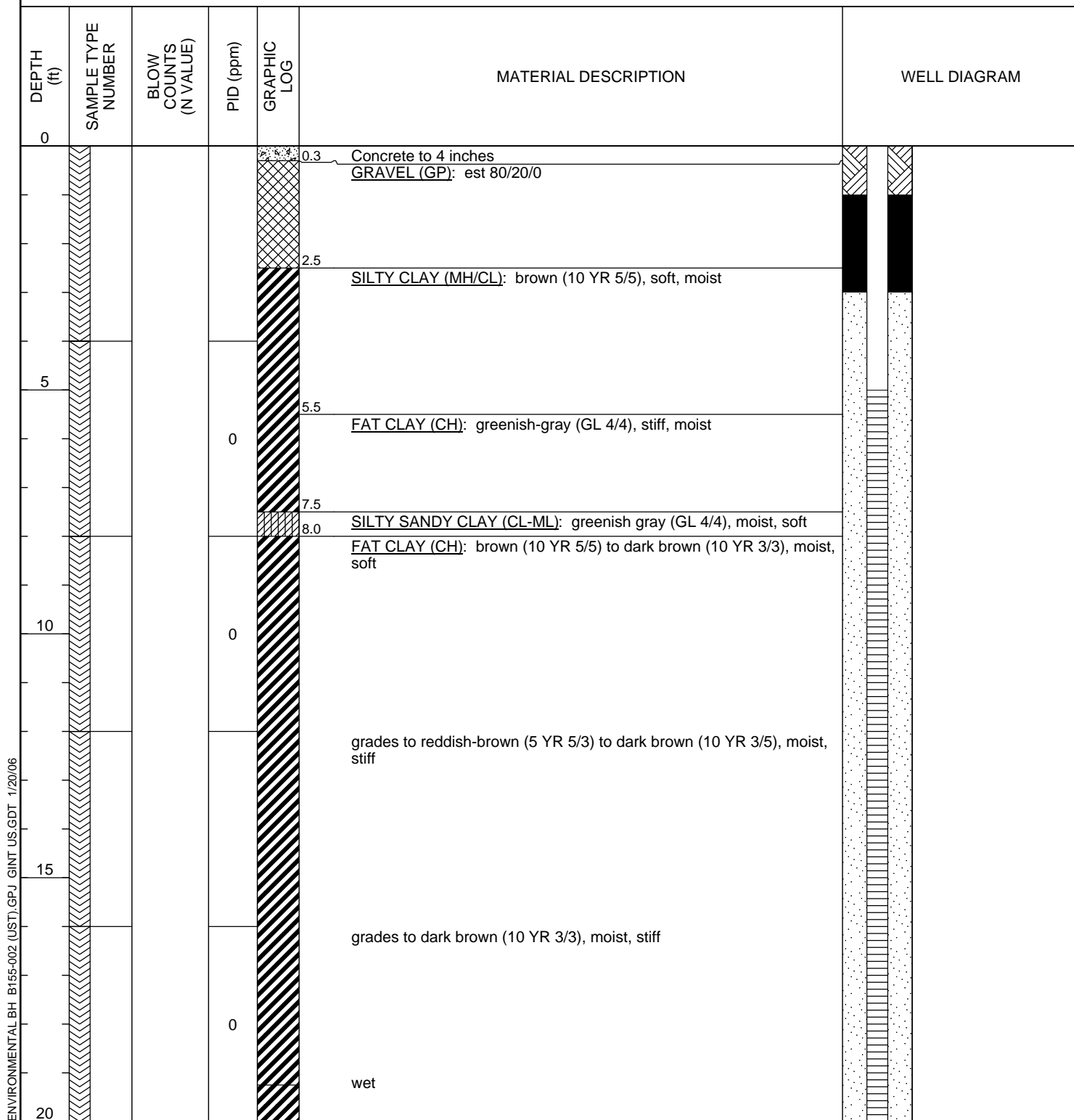


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BORING NUMBER A016MW06

PAGE 1 OF 1

CLIENT	United States Department of the Navy	PROJECT NAME	UST A16
PROJECT NUMBER	B155-002	PROJECT LOCATION	Concord Naval Weapons Station
DATE STARTED	10/31/05	COMPLETED	11/1/05
DRILLING CONTRACTOR	Precision Drilling	GROUND ELEVATION	
DRILLING METHOD	Hollow Stem Auger	HOLE SIZE	8 Inches
LOGGED BY	J. Hamm	CHECKED BY	D. Grant
NOTES			
		GROUND WATER LEVELS:	
		AT TIME OF DRILLING	~16 Feet BGS
		AT END OF DRILLING	---
		AFTER DRILLING	---



Bottom of hole at 20.0 feet.



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BORING NUMBER AB-01

PAGE 1 OF 2

CLIENT United States Department of the Navy

PROJECT NAME UST A16

PROJECT NUMBER B155-002

PROJECT LOCATION Concord Naval Weapons Station

DATE STARTED 10/31/05

COMPLETED 10/31/05

GROUND ELEVATION _____

HOLE SIZE 2.25 Inches

DRILLING CONTRACTOR Precision Drilling

GROUND WATER LEVELS:

DRILLING METHOD GeoProbe

AT TIME OF DRILLING ~24 Feet BGS

LOGGED BY J. Hamm

CHECKED BY D. Grant

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
0.3					GRAVEL (GW): SILTY SAND (SM): 0/70/30, fine to medium, light olive brown (2.5 Y 5/4), moist, loose (est.), <u>FILL</u>	
3.0					SANDY SILT/SILTY CLAY (MH/CL): 0/0/100, light olive brown (2.5 Y 5/4), mottled with few light gray (2.5 YR 7/2) & dark grayish brown (2.5 YR 4/3) fine sand inclusions, stiff, moist	
7.5					SANDY ELASTIC SILT (MH): dark gray, 0/35/65, fine sand, stiff, slight petroleum odor grades to dry, stiff, no odor, olive (2.5 Y 4/4), brown	
10.0	1	23			FAT CLAY (CH): 0/0/100, high plasticity, high dry strength, no dilatancy, high toughness, moist, very stiff, dark brown (10 YR 3/3)	
15	2	0			Varying amounts of fine sand 12' - 18', grades to dark gray (10 YR 4/1), stiff, grades to brown (10 YR 5/3)	
20					Occasional silt stone inclusions, hard, blocky, pale yellow (2.5 Y 8/4) & black fine to medium sand grains	

ENVIRONMENTAL BH B155-002 (UST).GPJ GINT US.GDT 1/20/06

(Continued Next Page)



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BORING NUMBER AB-01

PAGE 2 OF 2

CLIENT United States Department of the Navy

PROJECT NAME UST A16

PROJECT NUMBER B155-002

PROJECT LOCATION Concord Naval Weapons Station

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20						
	3		0		Occasional silt stone inclusions, hard, blocky, pale yellow (2.5 Y 8/4) & black fine to medium sand grains (<i>continued</i>)	
25					24.0 <u>CLAYEY SAND (SC):</u> 0/70/30, fine to medium sand, olive brown (2.5 Y 4/4), wet, loose	
					27.0 <u>FAT CLAY (CH):</u> 0/10/90, high plasticity, very high dry strength, no dilatancy, high toughness, brown (10 YR 5/4), wet	
30					30.0 Bottom of hole at 30.0 feet.	

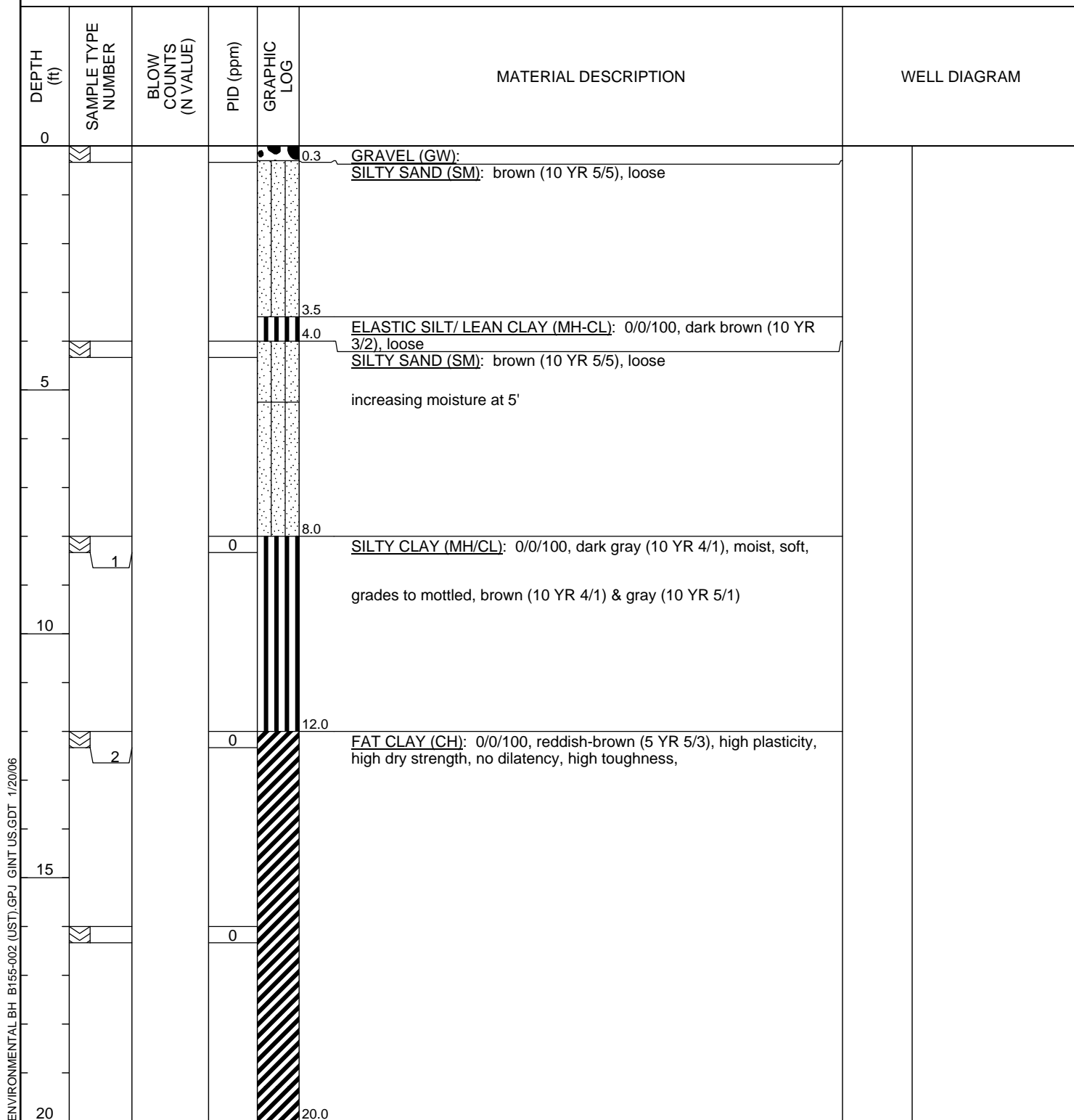


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BORING NUMBER AB-02

PAGE 1 OF 2

CLIENT	United States Department of the Navy	PROJECT NAME	UST A16
PROJECT NUMBER	B155-002	PROJECT LOCATION	Concord Naval Weapons Station
DATE STARTED	10/31/05	COMPLETED	10/31/05
DRILLING CONTRACTOR	Precision Drilling	GROUND ELEVATION	
DRILLING METHOD	GeoProbe	HOLE SIZE	2.25 Inches
LOGGED BY	J. Hamm	CHECKED BY	D. Grant
NOTES			
		GROUND WATER LEVELS:	
		AT TIME OF DRILLING	~24 Feet BGS
		AT END OF DRILLING	---
		AFTER DRILLING	---



ENVIRONMENTAL BH B155-002 (UST).GPJ GINT US.GDT 1/20/06

(Continued Next Page)



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BORING NUMBER AB-02

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CLIENT United States Department of the Navy

PROJECT NAME UST A16

PROJECT NUMBER B155-002

PROJECT LOCATION Concord Naval Weapons Station

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20						
	3		0		CLAYEY SAND (SC): 0/60/40, brown (7.5 YR 5/2), fine sand, wet, loose	
					21.5	
					FAT CLAY (CH): 0/5/95, brown (7.5 YR 5/2), high plasticity, very high dry strength, no dilatency, high toughness, moist, stiff	
					24.0	
25					CLAYEY SAND (SC): 0/70/30, fine sand, brown (7.5 YR 3/2), wet, loose	
					25.0	
					FAT CLAY (CH): brown (10 YR 5/5), moist, stiff	
					29.5	
30					CLAYEY SAND (SC):	
					30.0	
					Bottom of hole at 30.0 feet.	



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BORING NUMBER AB-03

PAGE 1 OF 2

CLIENT United States Department of the Navy

PROJECT NAME UST A16

PROJECT NUMBER B155-002

PROJECT LOCATION Concord Naval Weapons Station

DATE STARTED 10/31/05

COMPLETED 10/31/05

GROUND ELEVATION _____

HOLE SIZE 2.25 Inches

DRILLING CONTRACTOR Precision Drilling

GROUND WATER LEVELS:

DRILLING METHOD GeoProbe

AT TIME OF DRILLING ~24 Feet BGS

LOGGED BY J. Hamm

CHECKED BY D. Grant

AT END OF DRILLING ---

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
					0.3 GRAVEL (GW): SILTY SAND (SM): brown (10 YR 5/5), moist, loose	
					3.0	
					SILTY CLAY (CL-ML): dark brown (10 YR 3/5), moist, soft	
5						
					grades to moist, petroleum odor, gray	
					grades to no odor, brown (10 YR 5/5)	
	1		0		9.0	
10					FAT CLAY (CH): 0/0/100, brown (10 YR 5/5) to dark brown (10 YR 3/3), moist, stiff	
					mottled gray (10 YR 5/1) & brown (10 YR 5/5)	
15						
					very stiff	
20					20.0	

ENVIRONMENTAL BH B155-002 (UST).GPJ GINT US.GDT 1/20/06

(Continued Next Page)



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CLIENT United States Department of the Navy **PROJECT NAME** UST A16
PROJECT NUMBER B155-002 **PROJECT LOCATION** Concord Naval Weapons Station

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
20						
	3		0		grades to brown (10 YR 5/5), stiff	
					22.0	
					22.5 SANDY SILT (ML): brown (10 YR 5/5), moist, loose	
					FAT CLAY (CH): reddish-brown (5 YR 5/3), wet	
25						
30					30.0	
					Bottom of hole at 30.0 feet.	

APPENDIX C
WELL COMPLETION FORMS



MONITORING WELL COMPLETION RECORD

MONITORING WELL

MONITORING WELL NO.: AO16MW05
PROJECT: CONCORD NWS
SITE: Bldg. A-16
BOREHOLE NO.: AO16MW05
WELL PERMIT NO.: n/a
TOC TO BOTTOM OF WELL: 20 feet

DRILLING INFORMATION

DRILLING BEGAN:
DATE: 10/31/05 TIME: 14:46
WELL INSTALLATION BEGAN:
DATE: 11/1/05 TIME: 16:30
WELL INSTALLATION FINISHED:
DATE: 11/1/05 TIME: 12:20
DRILLING CO.: Precision
DRILLER: Eduardo
LICENSE: not available
DRILL RIG: Geoprobe
DRILLING METHOD:
☒ HOLLOW STEM AUGER
☐ AIR ROTARY
☐ OTHER:
DIAMETER OF AUGERS:
ID: 4.25" OD: 8"

WELL CASING

☒ SCHEDULE 40 PVC
☐ OTHER:
PRODUCT:
MFG. BY:
CASING DIAMETER:
ID: OD: 2 inches
LENGTH OF CASING: 5 feet

WELL SCREEN

☒ SCHEDULE 40 PVC
☐ OTHER:
PRODUCT:
MFG. BY:
CASING DIAMETER:
ID: OD: 2 inches
SLOT SIZE: 0.020 inch
LENGTH OF SCREEN: 15 feet

BOREHOLE BACKFILL

AMOUNT CALCULATED:
AMOUNT USED:
☐ BENTONITE CHIPS, SIZE:
☐ BENTONITE PELLETS, SIZE:
☐ SLURRY:
☐ FORMATION COLLAPSE:
☐ OTHER:
PRODUCT:
MFG. BY:
METHOD INSTALLED:
☐ POURED ☐ TREMIE
☐ OTHER:

SURFACE COMPLETION

☒ FLUSH MOUNT
☐ ABOVE GROUND WITH BUMPER POST
☒ CONCRETE ☐ ASPHALT

1 bag cement for surface completion

SURVEY INFORMATION

TOC ELEVATION:
GROUND SURFACE ELEVATION:
NORTHING:
EASTING:
DATE SURVEYED:
SURVEY CO.:

ANNULAR SEAL

VOLUME CALCULATED:
AMOUNT USED: 1/2 bag (23.5 lbs)
☐ GROUT FORMULA (PERCENTAGES)
PORTLAND CEMENT:
BENTONITE:
WATER:
☒ PREPARED MIX
PRODUCT: Type I-II Cement
MFG. BY: Baseline
METHOD INSTALLED:
☒ POURED ☐ TREMIE
☐ OTHER:

BENTONITE SEAL

VOLUME CALCULATED:
AMOUNT USED: 1/2 bag of 47 lbs
PELLETS, SIZE:
x CHIPS, SIZE: 3/8 inch
☐ OTHER:
PRODUCT:
MFG. BY: Halliburton
METHOD INSTALLED:
x POURED ☐ TREMIE
☐ OTHER:
AMOUNT OF WATER USED: 2.5 gallons

FILTER PACK

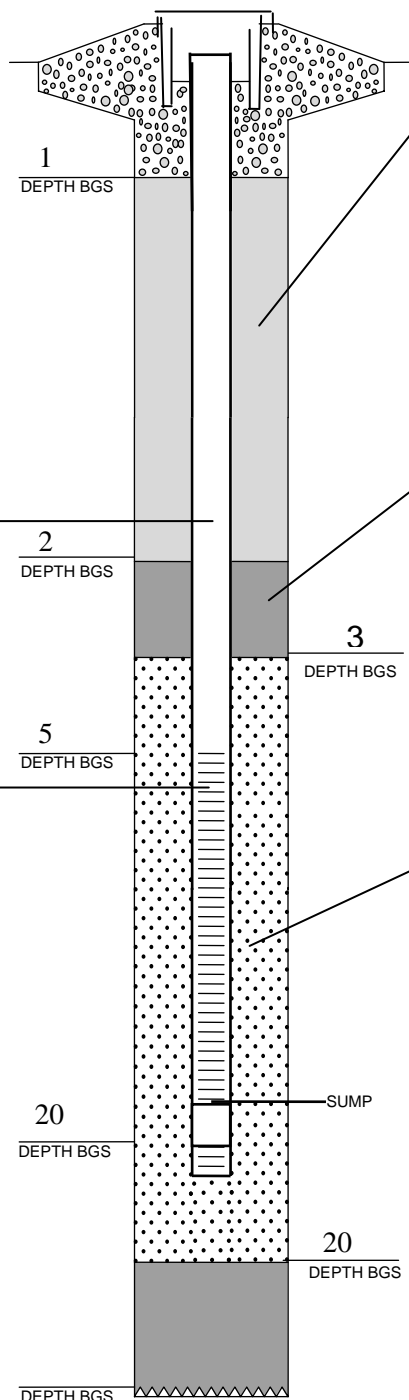
☐ PREPACKED FILTER
VOLUME CALCULATED:
AMOUNT USED: six 100-lb bags
x SAND, SIZE: #212
PRODUCT:
MFG. BY: RME Pacific Materials
METHOD INSTALLED:
x POURED ☐ TREMIE
☐ OTHER:
WATER LEVEL:
(BTOC AFTER WELL INSTALLATION)

CENTRALIZERS USED?

☐ YES ☒ NO;
CENTRALIZER DEPTHS:

LEGEND

BGS = BELOW GROUND SURFACE
BTOC = BELOW TOP OF CASING
N/A = NOT APPLICABLE
NR = NOT RECORDED
TOC = TOP OF CASING





MONITORING WELL COMPLETION RECORD

MONITORING WELL

MONITORING WELL NO.: AO16MW06
PROJECT: CONCORD NWS
SITE: Bldg. A-16
BOREHOLE NO.: AO16MW06
WELL PERMIT NO.: n/a
TOC TO BOTTOM OF WELL: 20 feet

DRILLING INFORMATION

DRILLING BEGAN:
DATE: 10/31/05 TIME: 4:45
WELL INSTALLATION BEGAN:
DATE: 11/1/05 TIME: 10:00
WELL INSTALLATION FINISHED:
DATE: 11/1/05 TIME: 12:40
DRILLING CO.: Precision
DRILLER: Eduardo
LICENSE: not available
DRILL RIG: Geoprobe
DRILLING METHOD:
☒ HOLLOW STEM AUGER
☐ AIR ROTARY
☐ OTHER:
DIAMETER OF AUGERS:
ID: 4.25" OD: 8"

WELL CASING

☒ SCHEDULE 40 PVC
☐ OTHER:
PRODUCT:
MFG. BY:
CASING DIAMETER:
ID: OD: 2 inches
LENGTH OF CASING: 5 feet

WELL SCREEN

☒ SCHEDULE 40 PVC
☐ OTHER:
PRODUCT:
MFG. BY:
CASING DIAMETER:
ID: OD: 2 inches
SLOT SIZE: 0.020 inch
LENGTH OF SCREEN: 15 feet

BOREHOLE BACKFILL

AMOUNT CALCULATED:
AMOUNT USED:
☐ BENTONITE CHIPS, SIZE:
☐ BENTONITE PELLETS, SIZE:
☐ SLURRY:
☐ FORMATION COLLAPSE:
☐ OTHER:
PRODUCT:
MFG. BY:
METHOD INSTALLED:
☐ POURED ☐ TREMIE
☐ OTHER:

SURFACE COMPLETION

☒ FLUSH MOUNT
☐ ABOVE GROUND WITH BUMPER POST
☒ CONCRETE ☐ ASPHALT

1 bag cement for surface completion

SURVEY INFORMATION

TOC ELEVATION:
GROUND SURFACE ELEVATION:
NORTHING:
EASTING:
DATE SURVEYED:
SURVEY CO.:

ANNULAR SEAL

VOLUME CALCULATED:
AMOUNT USED: 1/2 bag (23.5 lbs)
☐ GROUT FORMULA (PERCENTAGES)
PORTLAND CEMENT:
BENTONITE:
WATER:
☒ PREPARED MIX
PRODUCT: Type I-II Cement
MFG. BY: Baseline
METHOD INSTALLED:
☒ POURED ☐ TREMIE
☐ OTHER:

BENTONITE SEAL

VOLUME CALCULATED:
AMOUNT USED: 1/2 bag of 47 lbs
PELLETS, SIZE:
x CHIPS, SIZE: 3/8 inch
☐ OTHER:
PRODUCT:
MFG. BY: Halliburton
METHOD INSTALLED:
x POURED ☐ TREMIE
☐ OTHER:
AMOUNT OF WATER USED: 2.5 gallons

FILTER PACK

☐ PREPACKED FILTER
VOLUME CALCULATED:
AMOUNT USED: six 100-lb bags
x SAND, SIZE: #212
PRODUCT:
MFG. BY: RME Pacific Materials
METHOD INSTALLED:
x POURED ☐ TREMIE
☐ OTHER:
WATER LEVEL:
(BTOC AFTER WELL INSTALLATION)

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